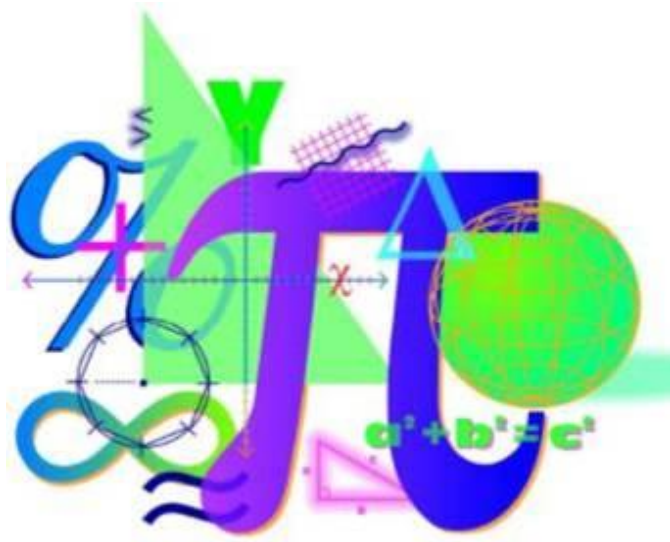# Spring 2012 Student Performance Analysis

**Geometry
Standards of Learning**

**Presentation may be paused and resumed
using the arrow keys or the mouse.**

Translating a Short Verbal Argument into Symbolic Form

SOL G.1

The student will construct and judge the validity of a logical argument consisting of a set of premises and a conclusion. This will include:

a) **identifying the converse, inverse, and contrapositive of a conditional statement;**

b) **translating a short verbal argument into symbolic form;**

c) **using Venn diagrams to represent set relationships; and**

d) **using deductive reasoning.**

Suggested Practice for SOL G.1

Students need additional practice using and interpreting the symbols :   **∨**   **∧**   **∴**

Let m represent:

      Angle A is obtuse.

Let n represent:

      Angle B is obtuse.

Which is a symbolic representation of the following argument?

      Angle A is obtuse if and only if Angle B is obtuse.

      Angle A is obtuse or Angle B is obtuse.

      Therefore, Angle A is obtuse and Angle B is obtuse.

A.	$m \rightarrow n$	B.	$m \rightarrow n$	C.	$m \leftrightarrow n$	D.	$m \leftrightarrow n$
	$m \wedge n$		$m \vee n$		$m \wedge n$		$m \vee n$
	$\therefore m \vee n$		$\therefore m \wedge n$		$\therefore m \vee n$		$\therefore m \wedge n$

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Verifying Parallelism Using Deductive Proofs

SOL G.2

The student will use the relationships between angles formed

by two lines cut by a transversal to

a)   determine whether two lines are parallel;

b)   verify the parallelism, using algebraic and coordinate methods as well as deductive proofs; and

c)   solve real-world problems involving angles formed when parallel lines are cut by a transversal.

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Suggested Practice for SOL G.2

Students need additional practice identifying which parts of a figure can be used to determine whether lines are parallel when more than one statement may be true.

Lines a and b intersect lines c and d.
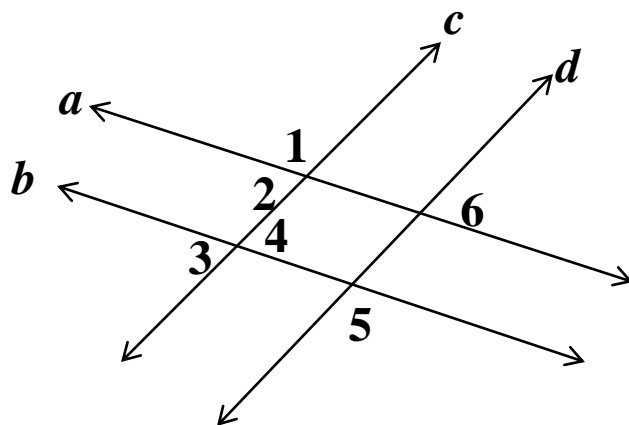
Which statement could be used to prove $a \parallel b$ and $c \parallel d$?

A. ∠1 and ∠2 are supplementary and ∠5 ≅ ∠6

B. ∠1 ≅ ∠3 and ∠3 ≅ ∠5

C. ∠3 and ∠5 are supplementary, and ∠5 and ∠6 are supplementary

D. ∠3 ≅ ∠4 and ∠2 ≅ ∠6

Applying Slope to Verify and Determine Parallel or Perpendicular Lines and
Determining Transformation of a Figure

SOL G.3

The student will use pictorial representations, including computer software, constructions, and coordinate methods, to solve problems involving symmetry and transformation. This will include

a) investigating and using formulas for finding distance, midpoint, and slope;

b) applying slope to verify and determine whether lines are parallel or perpendicular;

c) investigating symmetry and determining whether a figure is symmetric with respect to a line or a point; and

d) determining whether a figure has been translated, reflected, rotated, or dilated, using coordinate methods.

Suggested Practice for SOL G.3

Students need additional practice using slopes related to parallel or perpendicular lines.

Line a passes through points with coordinates (-4, 5) and (2, -2). What is the slope of a line perpendicular to line a?

Slope of perpendicular line = [ ] $\dfrac{6}{7}$

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Suggested Practice for SOL G.3

Students need additional practice finding the coordinates of vertices after a figure has been transformed.

Given: Triangle ABC with vertices located at
A**(1, 1), B(2, -3), and C(-1, -4).**

Triangle ABC will be reflected over the line $y = x$. What will be the integral coordinates of point C' after this transformation?

$C'($ ☐ , ☐ $)$

$C'($ -4 , -1 $)$

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Determining the Range in Which the Length of the Third Side of a Triangle Must Lie

SOL G.5

The student, given information concerning the lengths of sides and/or measures of angles in triangles, will

a) order the sides by length, given the angle measures;

b) order the angles by degree measure, given the side lengths;

c) determine whether a triangle exists; and

d) determine the range in which the length of the third side must lie.

These concepts will be considered in the context of real-world situations.

Suggested Practice for SOL G.5

Students need additional practice finding all possible lengths for a third side of a triangle when given lengths of two sides of the triangle.

Given: Triangle ABC with AB = 42 and BC = 20

Which of the following are possible lengths for AC?

12   20   22   **32**   **42**   **50**   62   70

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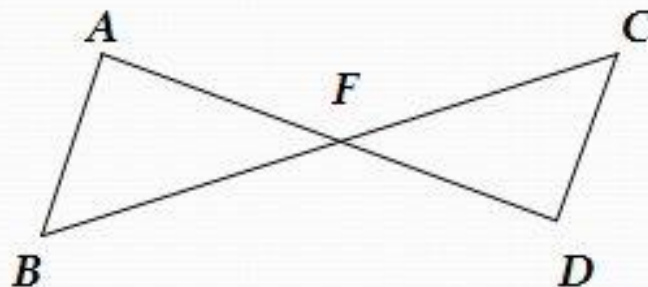EDUCATION

Proving Triangles Congruent

SOL G.6
The student, given information in the form of a figure or statement, will prove two triangles are congruent, using algebraic and coordinate methods as well as deductive proofs.

Suggested Practice for SOL G.6

Students need additional practice completing the steps and reasons in two-column deductive proofs that prove triangles congruent.

Given: $\overline{AB} \parallel \overline{CD}$, $\overline{AF} \cong \overline{FD}$

Prove: $\triangle ABF \cong \triangle DCF$

Proving Triangles Similar

SOL G.7
The student, given information in the form of a figure or statement, will prove two triangles are similar, using algebraic and coordinate methods as well as deductive proofs.

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Suggested Practice for SOL G.7

Students need additional practice proving triangles similar by using postulates or theorems.

Given: $\overline{AB} \parallel \overline{CD}$
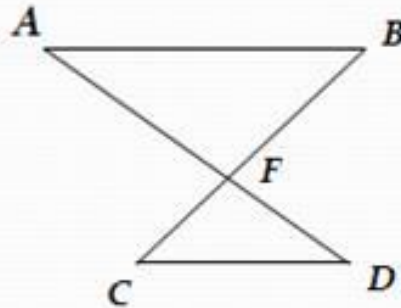
Prove: $\triangle ABF \sim \triangle DCF$

Solving Problems Using Trigonometry

SOL G.8
The student will solve real-world problems involving right triangles by using the Pythagorean Theorem and its converse, properties of special right triangles, and right triangle trigonometry.

Suggested Practice for SOL G.8

Students need additional practice using trigonometry to solve practical problems.

A ladder leans against a wall. The bottom of the ladder is 10 feet from the base of the wall, and the top of the ladder makes an angle of 25° with the wall. Find the length, x, of the ladder.

$x = 23.7$ ft.

25°

x

10 ft.

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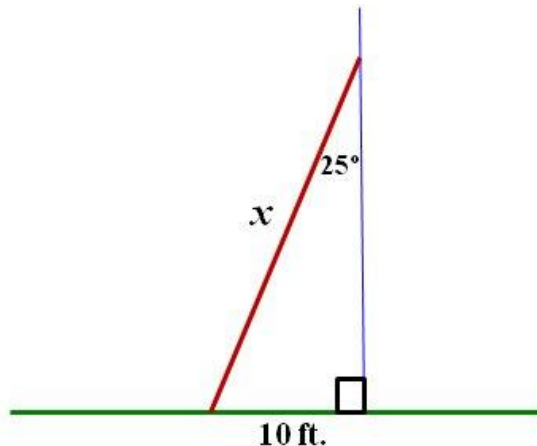
Solving Problems Involving Angles of Polygons

SOL G.10

The student will solve real-world problems involving angles of polygons.

Suggested Practice for SOL G.10

Students need additional practice understanding the relationship between the measures of the angles of a polygon and its ability to tessellate a plane.

Which of these regular polygons could tessellate a plane?

Square   Pentagon   Octagon   Hexagon   Decagon

Solve Problems Involving Circles
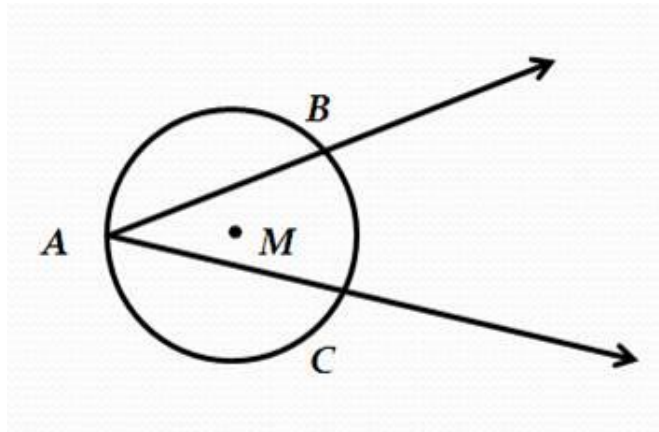
SOL G.11

The student will use angles, arcs, chords, tangents, and secants to

a) **investigate, verify, and apply properties of circles;**
b) **solve real-world problems involving properties of circles; and**
c) **find arc lengths and areas of sectors in circles.**

Suggested Practice for SOL G.11

Students need additional practice using a measure of one part of the circle to find measures of other parts of the circle.

Given: Circle M with secants $\overrightarrow{AB}$ and $\overrightarrow{AC}$

$m \angle A$ = 30°

If the length of arc BC is 3 cm, what is the circumference of the circle? $18\ cm$

Suggested Practice for SOL G.11

Bob divides his circular garden into 10 congruent sectors to plant different types of flowers. The circumference of Bob's garden is 50.5 feet. What is the area of one sector of Bob's garden?

1-Draw a figure.

2- Find diameter or radius.

3- Find the area.

4- Find the area of one sector.

Approximately 20.3 sq ft

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Solve Problems Involving Circles

SOL G.12

The student, given the coordinates of the center of a circle and a point on the circle, will write the equation of the circle.

Suggested Practice for SOL G.12

Students need additional practice using the equation of a circle to identify the radius, diameter, center, and/or a point on the circle.

The coordinates of the center of a circle are (-2, 6). This circle has a diameter of 10 units.

a)   **What is the equation of the circle?** $(x + 2)^2 + (y - 6)^2 = 25$

b)   **Give the integral coordinates of two points that lie on the circle.**

Possible points: $(-2,1), (-2,11), (-7,6), (3,6)$

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Suggested Practice for SOL G.12

The equation of a circle is $(x - 3)^2 + (y + 4)^2 = 16$.

a) What are the coordinates of the center of the circle? $(3,-4)$

b) What is the radius of the circle? 4

c) What is the diameter of the circle? 8

d) Give the integral coordinates of two points that lie on the circle.

Possible points: $(-1,-4)$ $(7,-4)$ $(3,-8)$ $(3,0)$

Changes in Dimensions or Area/Volume of Geometric Objects

SOL G.14

The student will use similar geometric objects in two- or three-dimensions to

a) compare ratios between side lengths, perimeters, areas, and volumes;

b) determine how changes in one or more dimensions of an object affect area and/or volume of the object;

c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and

d) solve real-world problems about similar geometric objects.

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Suggested Practice for SOL G.14

Students need additional practice determining the relationship between changes that affect one dimension (linear), changes that affect two dimensions (area), and changes that affect three dimensions (volume), particularly when figures are not provided.

A rectangular prism has a volume of 36 cm³.

a)   **If the height of the prism is tripled and the other dimensions do not change, what is the volume of the new rectangular prism?** 108 cm^3

b)   **If all dimensions of the original rectangular prism are tripled, what is the volume of the new rectangular prism?**

972 cm^3

Suggested Practice for SOL G.14

A cylinder has a surface area of 96 square inches. If all dimensions of this cylinder are multiplied by $\frac{1}{2}$ to create a new cylinder, what will be the surface area of the new cylinder?

24 square inches

Practice Items

This concludes the student performance information for the spring 2012 Geometry SOL test.

Additionally, test preparation practice items for Geometry can be found on the Virginia Department of Education Web site at:

http://www.doe.virginia.gov/testing/sol/practice_items/index.shtml#math